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## Description

This invention relates to a system for delivery of two separate components. More specifically, this invention relates to a system for delivery of two separate components by syringe, where the components are mixed at the site of delivery. Most specifically, this invention relates to the delivery of two components by syringe where the components are mixed at the site of delivery and the components are delivered along generally equivalent path lengths.

## BACKGROUND OF THE INVENTION

In the medical field, it may be desired to deliver two separate components to an active medical site. For instance, in the production of fibrin glue, it is desirable to deliver thrombin and fibrinogen to the same delivery site. As with the case in the formation of fibrin glue, it may be desirable to deliver the two components simultaneously and separately so that they only mix at the delivery site. For instance, with fibrin glue formation, if the components are delivered and mixed within a delivery system and then delivered to the delivery site, it is possible to clog the delivery system due to the adhesive nature of fibrin glue. On the other hand, other systems may need mixing at some point within the delivery tube. Of course, clogging of this tube is undesirable.

EP-A-156098 discloses two kinds of two-component syringe delivery systems. In the first kind, each of the two components is injected through a respective fluid pathway into a respective lumen of a four-lumen catheter. The two components thus mix on exit from the four-lumen catheter, having travelled along the catheter in parallel. In the second kind, the two fluid pathways merge at the upstream end of a hypodermic needle and mixing occurs down the length of the needle. In this second kind of delivery system, therefore, the mixing of the two components does not occur at or adjacent the delivery site itself.

Previous attempts at mixing the separate chemicals in a delivery system at the delivery site have met with little success. Therefore, common delivery systems may contain the improper mixture ratio of components, or have components mixed within the delivery system and then delivered, albeit over a short path length, to the delivery site. Devices which have attempted simultaneous delivery have been lacking in mechanisms for proper attachment of the delivery tubes. When these tubes clog, forces may cause the delivery tubes to separate from the syringe. Furthermore, systems where mixture is made at the delivery site are very difficult to manipulate. Frequent clearing of clogged components is necessary. Certainly, these present systems have all been virtually impossible to operate with one hand.

Finally, none of the typical two component deliv-

ery systems, regardless of the location of the mixture of the two components, have been capable of operating with typical hypodermic syringes locked in place within a sturdy, lightweight, and functional locking mechanism that ensures simultaneous delivery of both separate components in the delivery system. The two component delivery systems have been either too bulky to deliver the two components adequately, or too flimsy to hold the typical hypodermic syringes. Because these systems operate with one hand, they are hard to formulate within a convenient package.

## Summary of the Invention

Therefore, it is an object of the invention to provide a two component delivery system where the components are delivered at the delivery site simultaneously and separately.

It is further an object of the invention to provide a two component delivery system where the components are delivered separately and simultaneously to the delivery site along a single cannula.

Another object of the invention is to provide a delivery system which prevents clogging of mixed fluids by having the fluids come into contact near the exit port and toward the delivery site.

It is further an object of the invention to provide a two component syringe delivery system where the single cannula of the invention is adaptable for use with two typical hypodermic syringes.

It is yet another object of the invention to provide a two component syringe delivery system where the syringes in the system can be managed and held in place securely by a holder which allows for simultaneous delivery of the two components through equivalent pressures on the two syringes.

It is a final object of the invention to provide a two component syringe delivery system in which clogging is prevented along the entire length of the fluid paths of both components by preventing mixture of the two components until both components have exited the system, so that mixture is obtained at the delivery site.

These and other objects of the invention are accomplished in a system according to claim 1. Preferably, two typical hypodermic syringes can be locked in place within a syringe holder to provide uniform delivery of the two components. The syringe holder is formed such that the syringes are insertable through the holder itself and then locked in place along a channeled upper surface to prevent movement of either syringe. In addition, a plunger clip may be inserted over the plungers of the syringes so that pressure can be equally distributed to both syringes during operation of the system.

In a preferred embodiment of this invention, the two components are delivered into an assembled luer

attachment which comprises a double luer (or luer lock) fitting attachable to both syringes. Within the syringes, there is described a double fluid path so that the fluids run parallel to each other at the exit of the luer attachment. At the attachment exit, there is insertable a single cannula. Projecting from the attachment is a length of tubing containing one of the elements. This tubing fits within the cannula so that one element travels the length of the cannula without contacting the cannula, down the length of the tubing. The other element exits the attachment and is forced around the tubing through the length of the cannula. The elements mix at or near the exit from the cannula, the first element exiting through the tubing and the second element exiting from the cannula and around the tubing. Again, the elements mix at or near the delivery site, and any reactive material is easily ejected from the large diameter cannula.

The invention described in this summary will be better understood by reference to the attached figures and the detailed description of the invention.

#### Detailed Description of the Drawings

The invention is described in connection with the accompanying figures in which:

Fig. 1 is a perspective view of the syringes of the two component delivery system inserted into the syringe holder;

Fig. 2 is an exploded elevation view in partial cross-section of an alternate embodiment of the present invention incorporating a single cannula fitted over a separate length of tubing at the delivery site;

Fig. 3 is a elevation view in partial cross-section of the assembled tubing/cannula system; and

Fig. 4 is an assembled two component delivery system incorporating the invention.

#### Detailed Description of the Invention

As seen in Figures 1-4, the two component syringe delivery system has as its basis two separate syringes 10, 20 for delivery of separate components. For instance, in one syringe there may be fibrinogen, and in an alternate syringe there may be thrombin. The combination will be mixed together at the delivery site for the formation of fibrin glue.

The first component of the delivery system to be discussed is the holding mechanism 100 which assures proper delivery of the two components simultaneously. In the present holder 100, there are located bored holes 105a, 105b and 106a, 106b, for both syringes and two sets of flanges 110, 120 for locking, separated by arm 115. The lower set of flanges 120a, 120b, keep the syringes 10, 20 in place from rotating around the upper set of flanges 110a, 110b. The upper flanges 110a, 110b ensure that the two syringes

10, 20 remain in desired position.

Located in the upper flanges 110a, 110b are channels 130a, 130b which form a locking mechanism for the syringes. On the syringes 10, 20 there are ears 12a, 12b and 22a, 22b, which are usually gripped during individual operation of the syringes. These ears 12a, 12b, 22a, 22b, can be incorporated into channels 130a, 130b by first inserting the syringes 10, 20 into the sets of holes 105, 106 and then rotating the ears of the syringes into channels 130a, 130b, as with locked syringe 20 in Fig. 1.

When locked in place, both syringes 10, 20 are fixed in parallel or at an angle and can be given the appropriate amount of pressure to deliver simultaneously the two components of the system. When angled, the syringes 10, 20 provide uniform mixing of the two components and can be used in a spray which mixes either at or near the delivery site. Simultaneous delivery is accomplished by the placement of plunger clip 140 at the plunger heads 15, 25 of the two syringes 10, 20. It is to be noticed that the clip 140 itself has channeled grooves 142, 144 which fit along the outer diameters of the beads 15, 25 of the two syringes 10, 20, so that the heads 15, 25 are positioned at the desired angle along the entire fluid paths. Heads 15, 25 are able to move within the clip 140 so that depression of both syringes 10, 20 is accomplished simultaneously.

Thus, the user grasps the syringes with the thumb crossing the length of cap 140, the palm bridging the length of syringes 10, 20 and the index and third finger holding the holder 100 across the flanges 110a, 110b. By forcing the thumb on the cap 140, equivalent pressures are provided to both syringes 10, 20, and equivalent amounts of fluid are delivered from both syringes 10, 20.

The single cannula solution according to the invention is found in Figures 2-4. There is shown connector 200 which has a double luer fitting 208, 218. This fitting 208, 218 may be a general or luer lock fitting. This connector 200 contains hollowed double fluid path 209, 219 which is formed from tubing or plastic molding. At the end of the double fluid path 209, 219 there is luer hub 220. Attached through luer hub 220 is fluid path 219, which allows the fluid from syringe 20 to flow directly through the hub 220. Fluid in first path 209 is deposited into hub 220. Thus, the central portion of hub 220 can be filled with fluid from syringe 10.

Single cannula fitting 240 has a cannula 242 extending from it so that cannula 242 would allow approximately twice the volume of fluid as compared to fluid path 219. When single cannula fitting 240 is fit within the luer hub 220, therefore, equivalent volumes of the fluid from syringe 10 travel the length of the cannula 242 half filled with fluid path 219, with equivalent volumes of the fluid from syringe 20 flowing through the fluid path 219. Again, equivalent vol-

umes of both fluids reach the end of the cannula 242 simultaneously. Mixing can take place outside the cannula 242 so that clogging is prevented along the cannula 242.

In addition, fluid path 219 may end at some point near the end of cannula 242, so that mixing occurs just before the delivery site. Reacted materials are easily ejected from cannula 242 since its diameter is larger than either of paths 209, 219.

Thus, with the two component delivery system, equivalent pressures are derived and these equivalent pressures are able to provide for equivalent amounts of fluid flowing the length of the system. When the equivalent amounts of fluid are ejected from the system, they are able to mix at the delivery site so that clogging is prevented in the system. In addition, chemical reactions can take place outside the cannula, or pre-mix before delivery without clogging as desired. Finally, the entire system is able to provide the proper amounts of fluid directly to the delivery site.

These and other objects of the present invention are to be determined from the attached claims.

#### Claims

1. A system for simultaneous delivery of fluids from two syringes (10, 20) comprising a length of tubing exiting one said syringe (20) and a cannula (242) exiting said opposite syringe (10), characterized in that said tubing fits within and terminates adjacent the free end of said cannula.
2. A system according to claim 1 comprising an attachment (200) for luer connection to both said syringes, each luer connection (208; 218) having attached to it a fluid path (209; 219), one said path (209) exiting from said attachment (200) at a luer hub (220), the other said path (219) exiting from said attachment in said length of tubing; said luer hub (220) providing luer attachment to said cannula (242).
3. The system of Claim 1 or claim 2 wherein said cannula (242) with said tubing fitted within said cannula (242), and said tubing, deliver generally equivalent volumes of fluid from each of said different syringes (10, 20).
4. The system of any preceding Claim wherein said syringes (10, 20) are held in place by a holder (100) having two sets of flanges (110, 120), each with a pair of holes (105a, 106a; 105b, 106b) described therein, each said hole in each said flange aligned with the corresponding hole in the opposite flange and each said hole large enough to fit a syringe therein, such that when each said

syringe (10; 20) is emplaced within one hole of each flange (110; 120), said syringes (10, 20) are parallel.

5. The system of Claim 4 wherein said syringes (10, 20) contain a plurality of ears (12a, 12b, 22a, 22b) and are held in place by a pair of channeled grooves (130a, 130b) on one of said flanges (110), said grooves (130a, 130b) locking the ears of said syringes (10, 20) within said grooves when said syringes (10, 20) are rotated within said holes.
6. The system of Claim 5 wherein said system delivers equivalent volumes of each fluid at the end of said cannula (242).
7. The system of Claim 6 wherein a plunger clip (140) with a pair of channeled grooves (142, 144) is emplaceable on the plungers (15, 25) of said syringes (10, 20) such that said channeled grooves (142, 144) hold said plungers (15, 25), and pressing said clip (140) causes the delivery of each said fluid from each said syringe (10, 20).
8. The system of claim 4, wherein each said syringe has a diameter, a pair of ears and a plunger for firing said syringe, said pair of flanges being separated by an arm, one hole on each said flange corresponding to one syringe diameter and one hole on each said flange corresponding to the opposite syringe diameter.

#### Patentansprüche

1. System zur gleichzeitigen Abgabe von Flüssigkeiten aus zwei Spritzen (10, 20) mit einem Leitungsabschnitt, der aus einer Spritze (20) austritt, und einer Kanüle (242), die aus der gegenüberliegenden Spritze (10) austritt, dadurch gekennzeichnet, daß die Leitung in das freie Ende der Kanüle paßt und nahe diesem endet.
2. System nach Anspruch 1, mit einer Halterung (200) für eine Luerverbindung mit beiden Spritzen, wobei jede Luerverbindung (208; 218) einen Flüssigkeitsweg (209; 219) aufweist, von denen der eine Weg (209) aus der Halterung (200) an der Luerbuchse (220) austritt, wogegen der andere Weg (219) aus der Halterung in den Leitungsabschnitt austritt; wobei die Luerbuchse (220) die Luerbefestigung für die Kanüle (242) bildet.
3. System nach Anspruch 1 oder 2, bei welchem die Kanüle (242) mit der in die Kanüle (242) eingepaßten Leitung und die Leitung allgemein äqui-

valente Flüssigkeitsmengen aus jeder der verschiedenen Spritzen (10, 20) abgeben.

4. System nach einem der vorhergehenden Ansprüche, bei welchem die Spritzen (10, 20) durch einen Halter (100) an Ort und Stelle gehalten werden, der zwei Sätze von Flanschen (110, 120) aufweist, die je mit einem Paar von Löchern (105a, 106a; 105b, 106b) versehen sind, wobei jedes dieser Löcher in jedem der Flansche mit dem entsprechenden Loch im gegenüberliegenden Flansch ausgerichtet ist und jedes der Löcher groß genug ist, um eine Spritze aufzunehmen, derart, daß die Spritzen (10, 20) parallel sind, wenn jede Spritze (10, 20) in einem Loch jedes Flansches (110, 120) angeordnet ist. 5
5. System nach Anspruch 4, bei welchem die Spritzen (10, 20) eine Vielzahl von Ohren (12a, 12b, 22a, 22b) aufweisen und durch ein Paar von kanalförmigen Nuten (130a, 130b) in jedem der Flansche (110) an Ort und Stelle gehalten werden, wobei die Nuten (130a, 130b) die Ohren der Spritzen (10, 20) in den Nuten verriegeln, wenn die Spritzen (10, 20) innerhalb der Löcher gedreht werden. 10
6. System nach Anspruch 5, bei welchem das System am Ende der Kanüle (242) äquivalente Mengen jeder Flüssigkeit abgibt. 15
7. System nach Anspruch 6, bei welchem eine Plungerhalteplatte (140) mit einem Paar von genuteten Kanälen (142, 144) auf den Plungern (15, 25) der Spritzen (10, 20) derart angeordnet werden kann, daß die Nuten (142, 144) die Plunger (15, 25) halten und ein Niederdrücken der Halteplatte (140) die Abgabe der jeweiligen Flüssigkeit aus jeder der Spritzen (10, 20) bewirkt. 20
8. System nach Anspruch 4, bei welchem die Spritze einen Durchmesser, ein Paar von Ohren und einen Plunger zum Betätigen der Spritze aufweist, wobei das Paar von Flanschen durch einen Arm getrennt ist, wobei ein Loch an jedem Flansch einem Spritzendurchmesser entspricht und ein Loch an jedem Flansch dem gegenüberliegenden Spritzendurchmesser entspricht. 25

#### Revendications

1. Système pour la distribution simultanée de liquides à partir de deux seringues (10, 20), comprenant une longueur de tube sortant d'une dite seringue (20) et une canule (242) sortant de ladite seringue opposée (10), caractérisé en ce que ledit tube est ajusté à l'intérieur et se termine au 30

voisinage de l'extrémité libre de ladite canule.

2. Système selon la revendication 1, comprenant une fixation (200) pour une fixation luer des deux dites seringues, chaque fixation luer (208, 218) étant attachée à un chemin de liquide (209, 219), un desdits chemins (209) sortant de ladite fixation (200) dans un moyeu (220), l'autre dit chemin (219) sortant de ladite fixation dans ladite longueur de tube ; ledit moyeu luer (220) fournissant une fixation luer à ladite canule (242). 35
3. Système selon les revendications 1 ou 2, dans lequel ladite canule (242) avec ledit tube ajusté dans ladite canule (242), et ledit tube, fournissent généralement des volumes équivalents de liquide de chacune desdites différentes seringues (10, 20). 40
4. Système selon l'une quelconque des revendications précédentes, dans lequel lesdites seringues (10, 20) sont maintenues en place par un support (100) ayant deux jeux de brides (110, 120), chacune ayant une paire de trous (105a, 106a ; 105b, 106b) décrits ci-après, chaque dit trou dans chaque bride étant aligné avec le trou correspondant de la bride opposée, et chaque dit trou étant assez grand pour ajuster une seringue dans celui-ci, de sorte que lorsque chaque dite seringue (10, 20) est placée dans chaque trou de chaque bride (110, 120), lesdites seringues sont parallèles. 45
5. Système selon la revendication 4, dans lequel lesdites seringues (10, 20) possèdent une pluralité d'oreillettes (12a, 12b, 22a, 22b) et sont maintenues en place par une paire de gorges cannelées (130a, 130b) sur l'une desdites brides (110), lesdites gorges (130a, 130b) bloquant les oreillettes desdites seringues (10, 20) dans lesdites gorges lorsque lesdites seringues (10, 20) sont tournées dans lesdits trous. 50
6. Système selon la revendication 5, dans lequel ledit système fournit des volumes équivalents de chaque liquide à l'extrémité de ladite canule (242). 55
7. Système selon la revendication 6, dans lequel une attache de piston (140) ayant une paire de gorges cannelées (142, 144) est positionnable sur les pistons (15, 25) desdites seringues (10, 20) de sorte que lesdites gorges cannelées (142, 144) maintiennent lesdits pistons (15, 25), et une pression sur ladite attache (140) provoque la distribution de chaque dit liquide de chaque dite seringue (10, 20). 60

8. Système selon la revendication 4, dans lequel chaque dite seringue a un diamètre, une paire d'oreillettes et un piston pour comprimer ladite seringue, ladite paire de brides étant séparée par un bras, un trou de chaque dite bride correspondant au diamètre d'une seringue et un trou de chaque dite bride correspondant au diamètre d'une seringue opposée.

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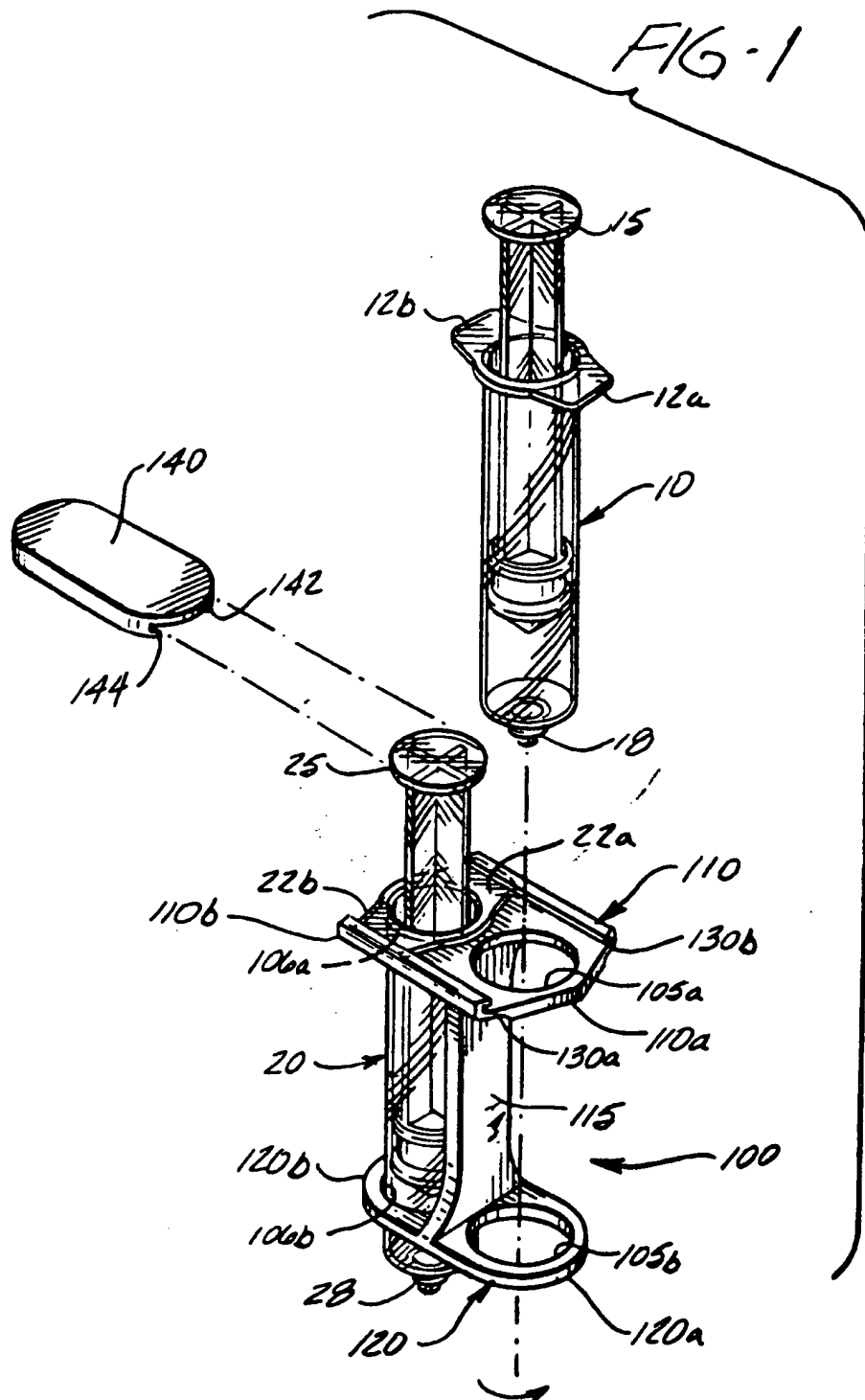


FIG-2

